

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF THE CLAIMS:**

1. - 4. (Canceled)

5. (Previously Presented) The method of claim 13, further comprising down-sampling motion vectors of the input compressed video stream.

6. (Original) The method of claim 5, further comprising comparing candidate motion vectors and prediction modes decoded from the first compressed video stream and selecting the motion vector with the minimum sum of absolute differences as the resulting motion vector.

7. (Canceled)

8. (Currently Amended) The method of claim [[7]] 10, further including transcoding all reference I and P pictures because of the reuse of motion vectors and to maintain the prediction sequential order, while not transcoding and skipping non-reference B pictures that carry less information.

9. (Original) The method of claim 8, wherein skipped B pictures are reconstructed at the decoder to ensure a full frame rate playback.

10. (Currently Amended) The A method of Claim 7 transcoding an input compressed signal stream to an output compressed signal stream, the signal stream being a video stream compressed pursuant to the standards of the Moving Picture Experts Group (MPEG), and within a Group of Pictures (GOP) three types of pictures are distinguished according to a compression method used: Intra-mode pictures (I pictures) which are

compressed independently of any other picture, Predictively motion-compensated pictures (P pictures) which are reconstructed from the compressed data in that picture and two most recently reconstructed fields from previously displayed I or P pictures, and Bidirectionally motion-compensated pictures (B pictures) which are reconstructed from the compressed data in that picture plus two reconstructed fields from previously displayed I or P pictures and two reconstructed fields from I or P pictures that will be displayed in the future, said method further including comprising:

performing adaptive frame rate transcoding for a sub-GOP (Group of Pictures), said sub-GOP comprising one or more types of pictures of said input compressed signal stream to be transcoded, said performing including:

determining whether a picture is an I picture, a B picture or a P picture type from the picture header information;

transcoding all I pictures; and

if a series of pictures comprises a (B, P) pair, which starts with a B picture, may have zero, one or more intermediate B pictures, and ends with a P picture, applying adaptive picture rate transcoding with joint temporal-spatial rate control to the series of pictures of the (B, P) pair.

11. (Original) The method of claim 10, wherein the adaptive picture rate transcoding with joint temporal-spatial rate control comprises the following steps:

a. transcoding a P picture to obtain its rate denoted by  $R(P)$ , which is the bit count consumed by transcoding the P picture, and its distortion denoted by  $D(P)$ , such as PNR (Peak Signal-to-Noise Ratio) or SAD (Sum of Absolute Differences), in comparison with the input down-sampled video picture;

b. transcoding the following B picture to obtain its rate denoted by  $R(B)$ , which is the bit count consumed by transcoding the B picture, and its distortion denoted by  $D(B)$ , such as PNR (Peak Signal-to-Noise Ratio) or SAD (Sum of Absolute Differences), in comparison with the input down-sampled video picture;

c. summing  $R(B)$  and  $R(P)$  as a target bit count for the P picture, re-transcode it at one half of the incoming picture rate to obtain  $R(P_2)$  and  $D(P_2)$ ;

d. reconstructing a skipped picture and calculate its distortion  $D(S)$ , while the rate  $R(S)$  is zero, wherein the B picture is the skipped picture (S) and is reconstructed by averaging the previous I or P picture, which is the last coded picture of the previous sub-GOP, and picture  $P_2$  obtained in step c;

e. comparing the sum of distortion  $D(B)+D(P)$  with the sum of distortion  $D(S)+D(P_2)$ .

12. (Original) The method of claim 11, following the comparing step, selecting the smaller sum of distortion is preferred, and if the sum of distortion  $D(B)+D(P)$  is chosen, both frames are transcoded, otherwise, only the P frame is transcoded, store the P frame in a reference frame buffer, and proceed to the next sub-GOP.

13. (Canceled)

14. (Currently Amended) The method of claim [[13]] 10, further comprising: implementing a rate distortion optimization within said sub-GOP to adjust the output frame rate of the compressed output signal stream.

15. (Previously Presented) The method of claim 14, wherein a frame set S is defined to indicate certain frames to be either skipped or transcoded, said set  $S = [S_1, S_2, \dots, S_N]$ ,  $S_i \in [0,1]$ ,  $i = 1, \dots, N$ , with 0 denoting a frame to be skipped and 1 denoting a frame to be transcoded and N denoting a total number of frames in said sub-GOP, said adaptive frame rate transcoding further comprising: determining a status of a frame in said sub-GOP based on its corresponding value in set S.

16. (Previously Presented) The method of claim 15, wherein said rate distortion optimization determines which frames either to be skipped or coded within said sub-GOP to thereby minimize a total distortion of said compressed output signal stream.

17. (Canceled)